



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/716,765

11/19/2003

Sukesh Sandhu

303.596US2

6187

21186

7590

11/22/2005

SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH  
1600 TCF TOWER  
121 SOUTH EIGHT STREET  
MINNEAPOLIS, MN 55402

EXAMINER

NGUYEN, THANH T

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 11/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/716,765	SANDHU ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Thanh T. Nguyen	2813	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) 4-6 and 10-12 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 7-9 and 13-33 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Request for Continued Examination***

The request filed on 9/19/05 for a Request for Continued Examination (RCE) under 37 CFR 1.114 is acceptable and an RCE has been established. An action on the RCE follows.

### ***Election/Restrictions***

In view of the response filed on 9/19/05, claims 4-6, 10-12 are withdrawn from further consideration. The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 15, 18, 21 are recites the limitation "the tantalum layer" in line 2. There is insufficient antecedent basis for this limitation in the claim. It is suggested to change to "the tantalum oxide layer".

In claims 16, 19, 22, 25, 28, 21, the limitation "a oxide layer". There is a typographical error. It is suggested to change "an oxide".

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 13, 15-16, 18-20, 25, 27-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoon et al. (U.S. Patent No. 5,688,724).

Referring to figures 1-6, Yoon et al. teaches a method of forming a coupling dielectric in a memory cell comprising:

Forming SiO<sub>2</sub> (12) on a substrate (10) to the depth of about 30 angstroms (see col. 4, lines 8-10) by thermally grown (see col. 4, 1-5, meeting claim 19);

Forming Ta<sub>2</sub>O<sub>5</sub> (14) on the oxide (12), having a crystallization temperature on the oxide to a depth of between about 60 Angstroms and about 100 angstroms (see col. 4, lines 30-32);

Oxidizing the Ta<sub>2</sub>O<sub>5</sub> with rapid thermal process (RTP) at a temperature above the crystallization temperature for Ta<sub>2</sub>O<sub>5</sub> (see col. 4, lines 38-40, meeting claims 1, 7, 15, 18);

Forming a layer of Si<sub>3</sub>N<sub>4</sub> (16, cell nitride) on the layer of Ta<sub>2</sub>O<sub>5</sub> (14) to a depth of between about 40-60 Angstroms (see col. 5, lines 1-4); and

Forming a layer of SiO<sub>2</sub> (18, Noted that wetgate oxide is SiO<sub>2</sub> see instant invention page 6, lines 3-4) on the layer of Si<sub>3</sub>N<sub>4</sub> (16).

Regarding to claims 8, 11 forming Ta<sub>2</sub>O<sub>5</sub> on the oxide to a depth of between about 60 Angstroms and about 100 angstroms (see col. 4, lines 30-32).

Regarding to claim 24, 27, the oxide layer formed by CVD process (see col. 4, lines 1-5)

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 7-9, 14, 17, 21-24, 26, 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoon et al. (U.S. Patent No. 5,688,724) as applied to claims 13, 15-16, 18-20, 25, 27-28 above in view of Chao et al. (U.S. Patent No. 6,156,600) and Tseng (U.S. patent No. 5,712,208).

Referring to figures 1-6, Yoon et al. teaches a method of forming a coupling dielectric in a memory cell comprising:

Forming SiO<sub>2</sub> (12) on a substrate (10) to the depth of about 30 angstroms (see col. 4, lines 8-10) by thermally grown (see col. 4, 1-5, meeting claim 19);

Forming Ta<sub>2</sub>O<sub>5</sub> (14) on the oxide (12), having a crystallization temperature on the oxide to a depth of between about 60 Angstroms and about 100 angstroms (see col. 4, lines 30-32);

Oxidizing the Ta<sub>2</sub>O<sub>5</sub> with rapid thermal process (RTP) at a temperature above the crystallization temperature for Ta<sub>2</sub>O<sub>5</sub> (see col. 4, lines 38-40, meeting claims 1, 7, 15, 18);

Forming a layer of Si<sub>3</sub>N<sub>4</sub> (16, cell nitride) on the layer of Ta<sub>2</sub>O<sub>5</sub> (14) to a depth of between about 40-60 Angstroms (see col. 5, lines 1-4); and

Forming a layer of  $\text{SiO}_2$  (18, Noted that wetgate oxide is  $\text{SiO}_2$  see instant invention page 6, lines 3-4) on the layer of  $\text{Si}_3\text{N}_4$  (16).

Regarding to claims 8, 11 forming  $\text{Ta}_2\text{O}_5$  on the oxide to a depth of between about 60 Angstroms and about 100 angstroms (see col. 4, lines 30-32).

Regarding to claim 24, 27, the oxide layer formed by CVD process (see col. 4, lines 1-5)

However, the reference does not teach forming an oxide layer by using organic metal CVD, oxidizing the tantalum oxide with RTP in  $\text{N}_2\text{O}$  for about 55-65 seconds, the substrate by using n-type substrate, silicon, gallium arsenide, silicon on sapphire, germanium, or amorphous silicon, and the specific thickness range of the layer.

Chao et al. teaches depositing the Tantalum oxide using organic metal (TAETO) by LPCVD process at the thickness of about 70-150 Angstrom, then annealing the layer using RTA process in dinitrogen oxide ( $\text{N}_2\text{O}$ ) at the temperature about  $800^\circ\text{C}$  for about 40 sec. to 2 min. (see col. 4, lines 39-46).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would using organic metal (TAETO) to form the tantalum oxide layer in the CVD in process of Yoon et al. as taught by Chao et al. because the process would save time as well as provide a good step coverage.

Tseng et al. teaches in col. 7, lines 21-34, forming a substrate by using either silicon, gallium arsenide, silicon on sapphire, germanium, or amorphous silicon.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would forming a substrate by using either silicon, gallium arsenide, silicon on sapphire, germanium, or amorphous silicon in process of Yoon et al. as

Art Unit: 2813

taught by Tseng et al. because these materials provide a substrate with low thermal conductivity and high electron mobility.

It is known in the art to form the substrate by using an n-type or p-type to form an NMOS or PMOS transistor.

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form the substrate by using an n-type in process of Yoon et al. because forming a substrate by an N-type is known in the art to have an NMOS transistor.

It would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made to optimize the thickness range of the oxide layer, since it has been held that where the general conditions of a claim are disclosed in the prior art (i.e. oxide depth about 10-50 angstroms), discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105 USPQ 233 (CCPA 1955).

The specification contains no disclosure of either the critical nature of the claimed arrangement (i.e.- the oxide depth about 10-50 angstroms) or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen limitations or upon another variable recited in a claim, the applicant must show that the chosen limitations are critical. In re Woodruff, 919 F.2d 1575, 1578 (FED. Cir. 1990).

Therefore, it would have been obvious to a person of ordinary skill in the requisite art at the time of the invention was made would form the oxide layer by using any thickness in process of Yoon et al. because determining a optimum range for a layer involves only routine skill in the art.

*Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh Nguyen whose telephone number is (571) 272-1695, or by Email via address Thanh.Nguyen@uspto.gov. The examiner can normally be reached on Monday-Thursday from 6:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, can be reached on (571) 272-1702. The fax phone number for this Group is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956 (See **MPEP 203.08**).

A handwritten signature in black ink, appearing to read 'Thanh', with a long, sweeping horizontal stroke extending to the left.

Thanh Nguyen  
Patent Examiner  
Patent Examining Group 2800

TTN